

AF/GAU 2831



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Attorney Docket No. 040679/0439

In re patent application of

Haruhiko MURATA et al.

Serial No. 08/825,400

Filed: March 28, 1997

Group Art Unit: 2831

Examiner: K. Soderquist

For: IMPROVEMENT IN OR RELATING TO CIRCUIT BOARD HAVING
SOLDER BUMPS

AMENDMENT AND REPLY UNDER 37 C.F.R. § 1.116

RECEIVED

Assistant Commissioner for Patents
Washington, D.C. 20231
BOX AF

NOV 04 1998

GROUP 2100

Sir:

In reply to the Final Office Action dated July 30, 1998,
please amend the above-identified application as indicated below
and consider the remarks which follow:

IN THE DRAWINGS:

Please amend Figure 6 as shown on the attached copy.

ARGUMENTS
only

R E M A R K S

Figure 6 has been amended to correct certain typographical errors.

In the Office Action mailed July 30, 1998, claims 1 and 12 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 5,564,617 (Degani et al.), and claims 2-4 were rejected under 35 U.S.C. §103(a) as being unpatentable over Degani. These rejections are respectfully traversed for the following reasons.

On page 2, the Office action states Degani et al. disclose a plurality of solder bumps having tops which are free/unconnected, flat and leveled. Applicants respectfully submit that the solder paste patterns 36 (see Figure 3) do not correspond to the solder bumps of the present application. Instead, the solder paste patterns are simply masses of solder paste. The solder paste patterns 36 are formed into solder bumps after the reflow step. Figure 15A of the present application shows the differences between solder paste and solder bumps. Thus, Degani does not disclose solder bumps which are free, flat and leveled, as recited in claim 1 of the present application.

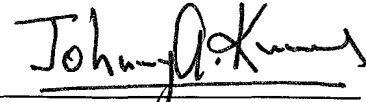
A disadvantage of the Degani technique is that the solder paste patterns (36) are likely to spread wider or flow sideways to cause adjacent solder paste patterns to join or contact with each other when the solder paste patterns are reflowed. This is particularly true when such solder paste patterns are densely arranged, i.e., in case of high density interconnections. In contrast, solder bumps, as defined in the present application, do not have the above-mentioned problem and thus are suited for high-density interconnection.

The solder bumps with flat tops, as recited in claim 1, become spherical and higher in level at the top when reflowed because of the surface tension. Consequently, the solder bumps are spaced away from the pads. The solder paste patterns in Degani, however, cannot produce such an effect.

Serial No. 08/825,400

In view of the above differences, applicants submit that claims 1-4 and 12 should be patentable over Degani, and an indication of the same is earnestly requested.

Respectfully submitted,



Johnny A. Kumar
Reg. No. 34,649

October 30, 1998

Date

FOLEY & LARDNER
Suite 500
3000 K Street, N.W.
Washington, DC 20007-5109
(202) 672-5300

a:A02